Name: _____ (4.1) Introduction to Similarity

Investigating Similar Triangles and Understanding Proportionality

Objective: This lesson is designed to help you discover the properties of similar triangles and to specifically understand the concept of proportionality. You will be determining the general conditions required to verify or prove that two triangles are similar.

1. List all **Triangle Congruence Postulates** that you know. There are five!
   Draw a picture of congruent triangles with the corresponding parts indicated for each postulate.

				(Right triangles)

2. Do you believe that having all three angles of a triangle congruent is another way to prove triangle congruence? Is AAA a triangle congruence postulate? Why or why not?

Symbol for Congruence: _____ Symbol for Equality: _____

3. Draw several examples of pairs of triangles that have the same shape (corresponding angles are congruent) but that are not the same size.

4. Can you think of a word that you could use to describe these triangles that look very much alike but that we have all agreed, are not congruent? _____

Symbol for _____: _____

Investigating Similar Triangles and Understanding Proportionality

Directions:

Identify the two triangles in your picture, ΔABC (the larger triangle) and ΔADE (the smaller triangle). You will be asked to identify and record certain measurements from each triangle in the chart below.

1. Using your ruler, measure the lengths of the sides of your larger triangle, ΔABC **in centimeters**. You will be measuring sides $\overline{AB}, \overline{BC}$ and $\overline{AC}$. Round to the nearest tenth of a centimeter. **Record the measurements below.**

2. Using your ruler, measure the lengths of the sides of the smaller triangle $\overline{AD}, \overline{DE}$ and $\overline{AE}$ **in centimeters.** Round to the nearest tenth of a centimeter. **Record the measurements below.**

3. Record the angle measures of your larger triangle, ΔABC. You will be recording $\angle A, \angle B$ and $\angle C$. Verify that the **sum** of the angles is $180°$.

4. **Using your ruler**, connect the two points D and E to create $\overline{DE}$, a segment **parallel** to segment $\overline{BC}$. Try to be careful and precise!

5. Using what you know about parallel lines and transversals, find the measures of $\angle ADE$ and $\angle AED$. **Record the information below**. What reasons could you give for why these angles have these measures?

   _____

   _____

6. What is the measure of $\angle DAE$? Why?

   _____

Steps 1-6: Record measurements here.

Measurements for ΔABC		Measurements for ΔADE	
$m\overline{AB}$	$m\angle A$	$m\overline{AD}$	$\angle DAE$
$m\overline{BC}$	$m\angle B$	$m\overline{DE}$	$m\angle ADE$
$m\overline{AC}$	$m\angle C$	$m\overline{AE}$	$m\angle DEA$

7. Using your ruler, your pencil and a piece of tracing paper, trace the smaller triangle, ΔADE. Glue or tape it to your paper next to ΔABC. You now have two similar triangles.

8. In the table below, **identify and list the corresponding sides and the corresponding angles** of your two triangles. Also, **label** each of the side lengths and angle measures **on the two pictures**. (Label ΔABC on the paper and label ΔADE on the tracing paper.)

Corresponding Sides	Corresponding Angles

9. **Create ratios using the corresponding sides of the two triangles.** Refer to your chart above for help. Write the ratios as shown in the table below. Once you have set up the ratios, find the quotient. (Use your calculator to find the answer to the division problem!)

Ratio #1 $\frac{\overline{AB}}{\overline{AD}}$	**Ratio #2** $\frac{\overline{BC}}{\overline{DE}}$	**Ratio #3** $\frac{\overline{AC}}{\overline{AE}}$

10. What do you notice about the **ratios** of the **corresponding sides**?

*We say that the sides are **proportional** because the ratios of the corresponding sides are _____.

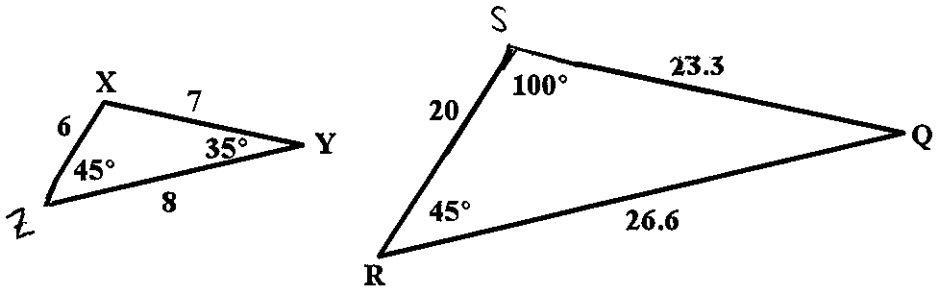
11. What did you notice about the **measures of corresponding angles?**

12. What have you discovered about **similar triangles?**

13. In your opinion, what **conditions** must be met in order for triangles to be considered similar? Do you think that these same conditions could apply to any closed figure? (Hexagon? Pentagon?)

Applying what you have learned:

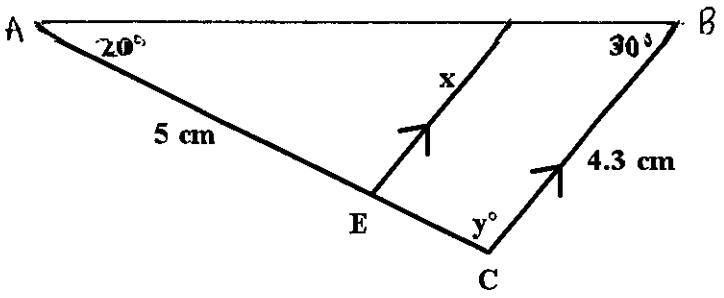
14. The two triangles below are similar. Explain why.
(*Hint:* Check all measures of corresponding angles and compare ratios of corresponding sides.)



15. For what values of x and y are the two triangles similar?
(*Hint:* The sides must be proportional; you will have to write a proportion.)

$\overline{AB}$ = 8 cm

$\overline{AC}$ = 6 cm



16. Here are two triangles that appear to be similar. Assign angle measures and side lengths that will **make** your two triangles similar. Have your partner verify that you created similar triangles.